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959,138

PATENT SPECIFICATION

DRAWINGS ATTACHED

959,138

Inventor: FREDERICK NETHERCLIFFE JUTSUN

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International Classification:—B 62 d (F 06 d)

COMPLETE SPECIFICATION

Improvements in or relating to Master Cylinders for Liquid Pressure Operating Systems

We, AUTOMOTIVE PRODUCTS COMPANY, LIMITED, a British Company, of Tachbrook Road, Leamington Spa, in the County of Warwick, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to master cylinders for liquid pressure operating systems such as are used for operating brakes and clutches of motor vehicles and for other purposes, and has for its object to provide an improved and simplified construction of such master cylinders.

According to the present invention, in a master cylinder for a liquid pressure operating system, outward or retractive movement of the master cylinder piston is limited by engagement of the outer end of the said piston with an internal flange formed on one end of a resilient metal sleeve split longitudinally from its other end to form a plurality of fingers each having an internal or external projection to engage an external or internal groove in the master cylinder, the said fingers being deformable outwardly or inwardly to enable the projections to pass over or into the master cylinder and spring into the groove therein.

The sleeve may also retain in position a flexible boot enclosing the rear end of the master cylinder.

Alternatively or in addition, the sleeve may retain in position a bush fitting inside the master cylinder around the piston and supporting a sealing ring serving to prevent leakage of liquid from an annular chamber surrounding the piston.

The master cylinder piston may be formed at its rear end with an axial bore to receive a push rod by which the said piston is operated, the push rod being retained in the said axial bore by a second longitudinally split resilient metal sleeve which at one end engages a shoulder on the push rod and which is formed with radial projections to engage in a circumferential groove in the wall of the said bore.

The invention is hereinafter described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation of one form of master cylinder according to the invention;

Figure 2 is a cross-section on the line 2—2 of Figure 1;

Figure 3 is a perspective view of a piston stop sleeve shown in Figure 1;

Figure 4 is a sectional elevation, similar to Figure 1, of a modified master cylinder;

Figure 5 is an elevation, partly in section of a piston stop sleeve used in Figure 4;

Figure 6 is a sectional elevation, similar to Figures 1 and 5, of another modified master cylinder;

Figure 7 is a sectional elevation of a push-rod retainer sleeve shown in Figures 1, 4 and 6; and

Figure 8 is a section on the line 8—8 of Figure 7.

Referring to Figures 1 and 2, a master cylinder comprises a tubular body 10 open at one end and having an enlarged internal diameter at 11 adjacent that end. A liquid reservoir 12 is secured to the body 10 by a clip 13, the interior of the reservoir 12 being in communication with the master cylinder bore through a relatively large orifice 14 and a smaller orifice 15, the orifice 14 being nearer to the open end of the master cylinder than is the orifice 15. A piston 16 has a head 17 which is a sliding fit in the main bore of the master cylinder and a reduced stem portion 18, the portion 18 passing through a double-lipped packing ring 19 supported in the inner end of the enlarged bore 11 by a bush 21 in which the stem portion 18 of the piston is a sliding fit. The head 17 of the piston 16 is arranged to support a cup packing 22 held in contact therewith by a piston return spring 23, and the outer end of the stem portion 18 of the piston is formed with an axial bore 24 to receive one end of a push rod 25 by which

effort applied to a pedal or other operating member is applied to generate liquid pressure in the master cylinder. The push rod 25 has a part-spherical head 26 engaging the inner end of the bore 24 and is free to rock to a limited extent relative to the piston.

A stop to limit outward or retractive movement of the piston 16 is provided by an internal flange 27 formed on a stop sleeve 28 shown in perspective in Figure 3 and arranged to be engaged by the rear end of the stem portion 18 of the piston. As shown in Figure 3, the sleeve 28 is split longitudinally from its end opposite to the flange 27 to form a plurality of fingers, for example eight, four alternate fingers 29 being longer than the remaining four fingers 31. The ends of the longer fingers 29 are bent outwardly as shown at 32 to form outward projections, and the ends of the shorter fingers 31 are similarly bent outwardly to form outward projections 33, the projections 33 extending outwardly beyond the projections 32. The sleeve 28 is formed of resilient metal, and is assembled with the master cylinder body 10 by deforming the fingers 29 inwardly, inserting them into the open end of the master cylinder and releasing them to allow the projections 32 to enter an internal circumferential groove 34 in the master cylinder body, thus holding the sleeve 28 in position relative to the master cylinder body. The parts are so dimensioned that, when the portion 18 of the piston 16 abuts against the flange 27, the cup packing 22 lies between the orifices 14 and 15 in the cylinder wall, so that a liquid pressure system to which the master cylinder is connected communicates with the reservoir 12 through the small orifice 15 when the piston 16 is retracted, and the annular space between the piston head 17 and the packing 19 is at all times in communication with the reservoir 12 through the orifice 14. The projections 32 also provide an abutment for the bush 21 to locate it axially in the enlarged portion 11 of the master cylinder bore.

A flexible cover or boot 35 closing the rear end of the master cylinder bore to prevent the entry of foreign matter fits closely around the push rod 25 at one end, and at its other end has an internal circumferential flange 36 which is engaged between the end of the master cylinder body 10 and the projections 33 on the sleeve 28, the projections 33 holding the said flange firmly against the end of the master cylinder body.

The push rod 25 is retained in position in the bore 24 in the piston 16 by a second resilient metal sleeve 37, shown separately in Figures 7 and 8. The sleeve 37 has an internal flange 38 at one end to engage behind the part-spherical head 26, and is split longitudinally at 39 so as to form two fingers 41 both arcuate in cross section. Parts of the fingers 41 are deformed outwardly as shown at 42 in Figures 7 and 8 to enter a circumferential groove 43 around the bore 24 and retain the sleeve 37 in the said bore.

In the modified arrangement shown in Figures 4 and 5 the master cylinder body, piston and bush supporting the double lipped packing are closely similar to those shown in Figure 1, and bear the same reference numerals. The reservoir 44 is a sheet metal can through which the master cylinder passes and in which the said master cylinder is secured by brazing. The piston stop sleeve in this arrangement is formed to fit over the open end of the master cylinder body, the said sleeve being shown at 45 in Figures 4 and 5. The sleeve 45 has an internal flange 46 at one end to be engaged by the rear end of the piston, and is divided from its other end for a substantial part of its length into a plurality of fingers 47, all of equal length, the said fingers 47 having their ends inturned, as shown at 48 in Figure 5, so that they are inclined inwardly towards the flanged end of the sleeve. The master cylinder body 10 is grooved externally at 49, Figure 4, the sleeve being assembled with the master cylinder body by deforming the fingers 47 outwardly, passing them over the end of the master cylinder and releasing them to enter the groove 49. A boot 50 to cover the rear end of the master cylinder fits over the sleeve 45, an internal flange 51 on the boot engaging the outer surface of the master cylinder body just in front of the groove 49 and being retained in position by the sleeve. The bush 21 in this arrangement is held in place by a clip ring 52 of the usual form, and the push rod 25 is retained in position relative to the piston by a sleeve 37 as described with reference to Figures 1, 7 and 8.

In the modified arrangement shown in Figure 6 the piston stop sleeve 53 is very similar to that shown in Figure 1, but the resilient fingers 54 are all of the same length and their outward projections 55 all engage in an internal circumferential groove 56 in the master cylinder body, the boot 57 being held in place by the internal flange 58 thereon engaging in an external circumferential groove 59 in the master cylinder body. The stop sleeve 53 also holds in place a bush 61 corresponding to the bush 21 in Figure 1.

WHAT WE CLAIM IS:—

1. A master cylinder for a liquid pressure operating system wherein outward or retractive movement of the master cylinder piston is limited by engagement of the outer end of the said piston with an internal flange formed on one end of a resilient metal sleeve split longitudinally from its other end to form a plurality of fingers each having an internal or external projection to engage an external or internal groove in the master cylinder, the said fingers being deformable outwardly or inwardly to enable the projections to pass over or into the master cylinder and spring into the groove therein.

2. A master cylinder according to claim 1, wherein the sleeve also retains in position a flexible boot enclosing the rear end of the master cylinder.

3. A master cylinder according to claim 1, wherein the sleeve also retains in position a bush fitting inside the master cylinder around the piston and supporting a sealing ring serving to prevent leakage of liquid from an annular chamber surrounding the piston.

4. A master cylinder according to any preceding claim and having the master cylinder piston formed at its rear end with an axial bore to receive a push rod by which the said piston is operated, wherein the push rod is retained in the said axial bore by a second longitudinally split resilient metal sleeve which at one end engages a shoulder on the push rod and which is formed with radial projections to engage in a circumferential groove in the wall of the said bore.

5. A master cylinder according to claim 2 and having the groove-engaging projections external to the resilient metal sleeve and engaging an internal groove in the master cylinder, wherein the said projections are formed on longer fingers alternating with shorter fingers and an internal flange on the boot is engaged between corresponding projections on said shorter fingers and the end of the master cylinder.

6. A master cylinder according to claim 2, and having the groove-engaging projections internally of the resilient metal sleeve to engage an external groove in the master cylinder, wherein the said projections are inclined inwardly towards the flanged end of the said sleeve, the boot enclosing the said sleeve and being formed with an internal circumferential flange which engages the master cylinder in front of the external groove so that the boot is retained on the master cylinder by the sleeve.

7. A master cylinder for a liquid pressure operating system substantially as described with reference to Figure 1, Figure 4 or Figure 6 of the accompanying drawings.

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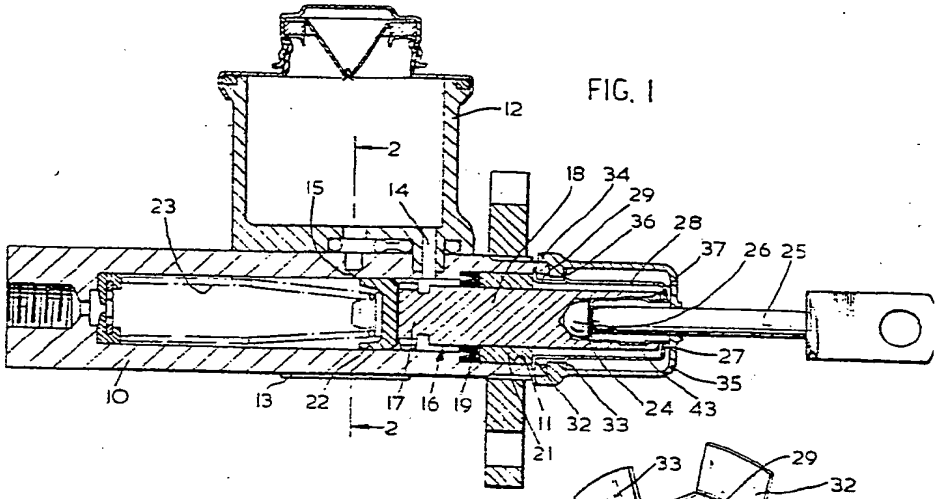

FIG. 1

FIG. 2

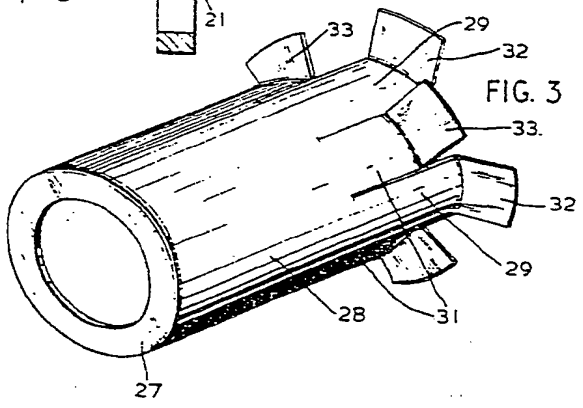

FIG. 3

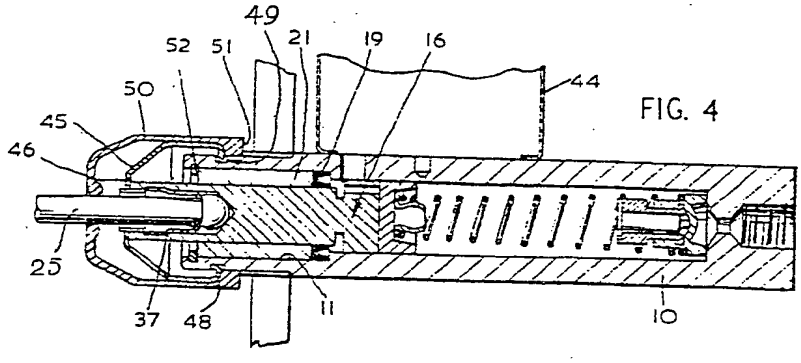

FIG. 4

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Sheets 1 & 2

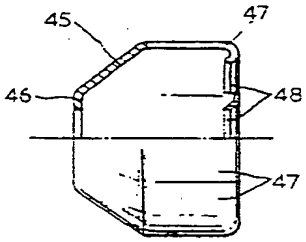
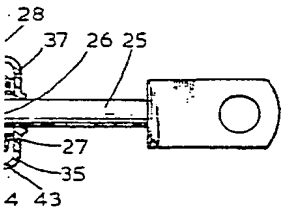


FIG. 5



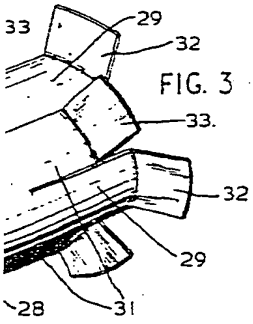


FIG. 3

FIG. 6

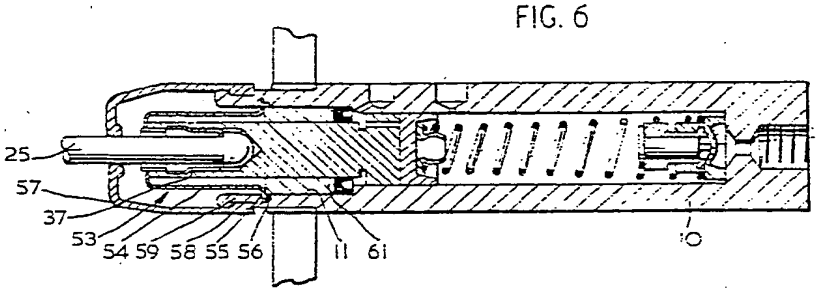


FIG. 7

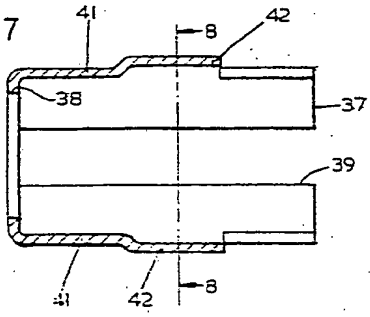


FIG. 8

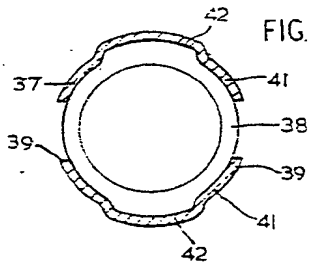
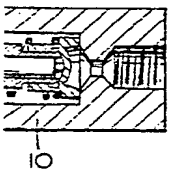


FIG. 4



959138 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

FIG. 1

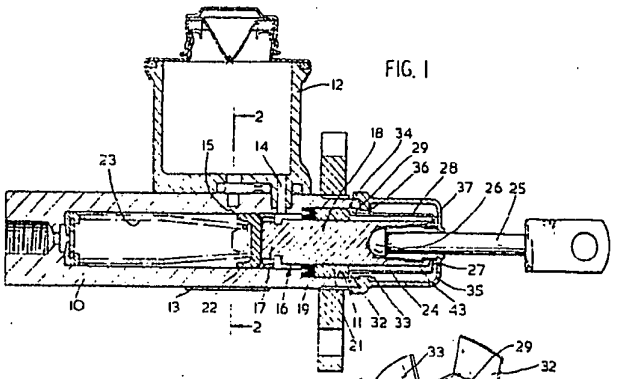


FIG. 2

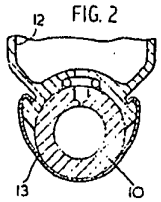


FIG. 3

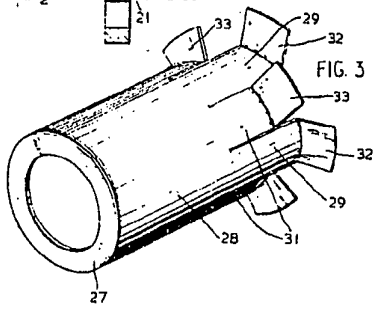


FIG. 4

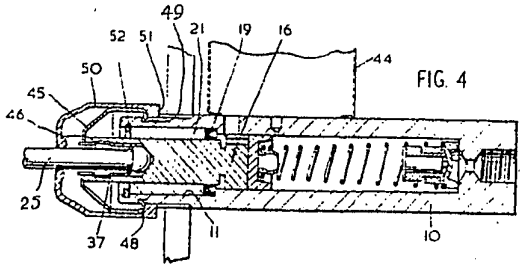


FIG. 5

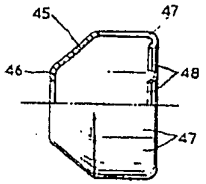


FIG. 6

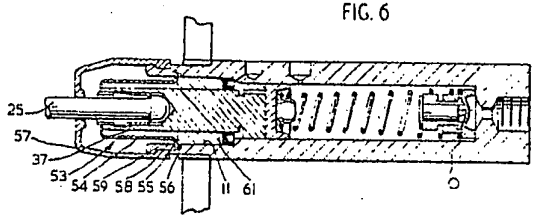


FIG. 7

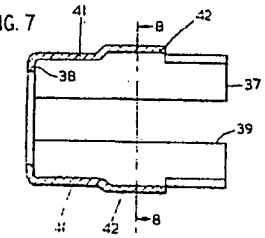


FIG 8